

Methods for Assessment of Mitigation Options

DENNIS A. TIRPAK, USA

Lead Authors:

M. Adler, USA; D. Bleviss, USA; J. Christensen, Denmark; O. Davidson, Sierra Leone; D. Phantumvanit, Thailand; J. Rabinovitch, Argentina; J. Sathaye, USA; C. Smyser, USA

CONTENTS

27.1. Introduction	837	27.5. Key Methodological Issues	840
27.2. Challenges in a Mitigation Options Assessment	837	27.6. Analytical Methods	841
27.3. Analytical Framework and Levels of Decisionmaking	838	27.7. Conclusions	842
27.4. Organizing a Mitigation Options Assessment	839	27.8. Obtaining a Copy of the Guidelines	843
27.4.1. Organizational Steps	839	References	843
27.4.2. Analytical Steps	839		

27.1. Introduction

This chapter is substantially different in focus from most of the preceding chapters on greenhouse gas (GHG) mitigation options. The preceding chapters focus on characterizing, from a global perspective, the full array of available mitigation options. This chapter instead addresses the analytical methods and processes for selecting and analyzing those mitigation options that best suit the specific needs, conditions, and national goals of individual countries. Its purpose is to help policy analysts and decisionmakers, especially in developing countries and countries with economies in transition, to obtain the objective information they need on mitigation options and to assist them in developing coherent national plans and strategies.¹

This chapter is a summary of a broader set of mitigation guidelines entitled *Methods for Assessment of Mitigation Options*, which is being published as a separate appendix to this report. The chapter summarizes several key points from these guidelines:

- The broad challenges facing decisionmakers and analysts in conducting an effective mitigation options assessment
- The mitigation assessment process, including organizational issues and analytical steps
- Some of the key cross-cutting issues involved in the mitigation assessment process
- The range of analytical methods available to meet most countries' needs and capabilities.

The full guidelines in *Methods for Assessment of Mitigation Options* contain the following documents:

- **Technical Report**—A detailed examination of the methods and issues involved in an assessment of mitigation options and the development of national mitigation plans and strategies
- **Appendix I: Technical Methods**—A catalog of analytical methods, describing in detail their purpose, appropriate applications, potential drawbacks, and references for further information
- **Appendix II: Resources Guide**—A detailed reference guide to other climate-related studies and programs, including a guide to databases and analytical models commonly used for mitigation options assessments
- **Appendix III: Case Studies**—A set of case studies illustrating mitigation assessment processes and key analytical methods and approaches employed by different developing and transition countries
- **Appendix IV: Mitigation Assessment Handbook**—Detailed descriptions of a limited set of basic models that most countries could use in assessing their mitigation options.

As mentioned, the chapter focuses on the analytical needs of developing countries and countries with economies in transition. Because these countries have many other pressing national issues that take precedence over global-environment

concerns, they often lack basic information and analytical capabilities for assessing mitigation options or organizing them into coherent national plans and strategies. For that reason, this chapter and its accompanying guidelines emphasize simple, readily available analytical methods and procedures (while not ignoring more sophisticated methods).

It should be pointed out that this chapter and the accompanying guidelines do not prescribe particular analytical methods or approaches to assessing mitigation options. Rather, the material presents a range of methods and approaches from which countries can select to meet their own needs and conditions. Developing countries and countries with economies in transition that need more practical assistance and support selecting and using these methods may be able to obtain such support through one of several multilateral and bilateral climate country-study programs being conducted.²

Before proceeding, it is worth defining a few key terms as they are used in this chapter:

- **Mitigation option:** A technology, practice, or policy that reduces or limits emissions of GHGs or increases their sequestration (This chapter does not consider measures to adapt to climate change.)
- **Mitigation options assessment:** The analytical process of identifying, selecting, and organizing mitigation options into a coherent national plan
- **Mitigation methods:** Analytical tools used to assess the impact and performance, costs and benefits, and social/political/institutional desirability of a mitigation option.

27.2. Challenges in a Mitigation Options Assessment

Before discussing specific methods or analytical steps, some of the broad challenges that analysts and policymakers face in organizing an assessment of mitigation options are worth noting. We have organized these into three broad categories:

- **Strategic challenges:** Strategic challenges affect the overall objectives of a mitigation options assessment and the process of selecting and implementing preferred options. Four strategic challenges stand out:
 - Integrating climate-change mitigation with other key national objectives which can require a clear set of national priorities, along with an analytical

¹ More specific information on methods for analyzing options that involve land-use changes—especially in the forestry and agriculture sectors, including biomass energy—is provided in Chapter 25.

² Climate country-study programs support developing countries and countries with economies in transition in developing national climate responses. A few examples include the UNEP/RISØ Climate Country Studies effort, the Asian Development Bank ALGAS project, and bilateral activities including those of the United States, Germany, Japan, and the Nordic countries.

process that consistently assesses options in light of these priorities

- Recognizing institutional constraints and deciding whether to fit a mitigation assessment process within these constraints or to seek additional institutional resources
- Relying on regional cooperation to address transboundary issues and to pool resources to lead to more effective assessments.
- Planning for future financing of mitigation options, particularly for developing and transition countries, and the role that the Global Environment Facility and others will play in providing these resources.
- **Analytical challenges:** Analytical challenges are those directly related to assessing mitigation options. Much of this chapter is about specific analytical issues, but analysts may face at least three broad challenges:
 - Employing the appropriate analytical methods effectively to address the specific needs, conditions, and capabilities of a country
 - Accommodating particularly dynamic economies and economies in transition in order to apply specific methods, especially forecasting, effectively
 - Accounting for ancillary costs and benefits and efficiency and equity issues to enhance the acceptability of options.
- **Informational challenges:** Several informational challenges often must be addressed in conducting comprehensive mitigation options assessments:
 - Gaining access to sources of information about technologies, costs, and country specific performance factors
 - Extracting useful data or information from the sources that are available
 - Accurately converting “imported” data or other information to properly reflect the operating conditions of the country in which the information is used.

27.3. Analytical Framework and Levels of Decisionmaking

We have chosen to organize the discussion of methods by national, cross-sectoral, sectoral, program, project, and technology decisionmaking levels, as illustrated in Figure 27-1. This framework is intended to reflect the links between different levels of an economy, the types of decisions made at those different levels, the information required to make those decisions, and, finally, the methods needed to obtain that information. Different organizational approaches are possible, but this framework highlights the importance of understanding the types of decisions to be made when selecting methods.

The four shaded levels in Figure 27-1 (i.e., the cross-sectoral, sectoral, program, and project levels) are the primary focus of this chapter. The national goals level—which addresses a country’s national priorities and policies—is outside the

purview of this report, although clear priorities and policies contribute to the effectiveness of a mitigation options assessment. Additional information on methods and issues associated with setting national priorities and policies can be found in the IPCC Working Group III volume of the Second Assessment Report. The technology assessment level is covered by the other mitigation chapters in this report and the Technology Characterization Inventory appendix. The decisionmaking levels of direct concern are described below

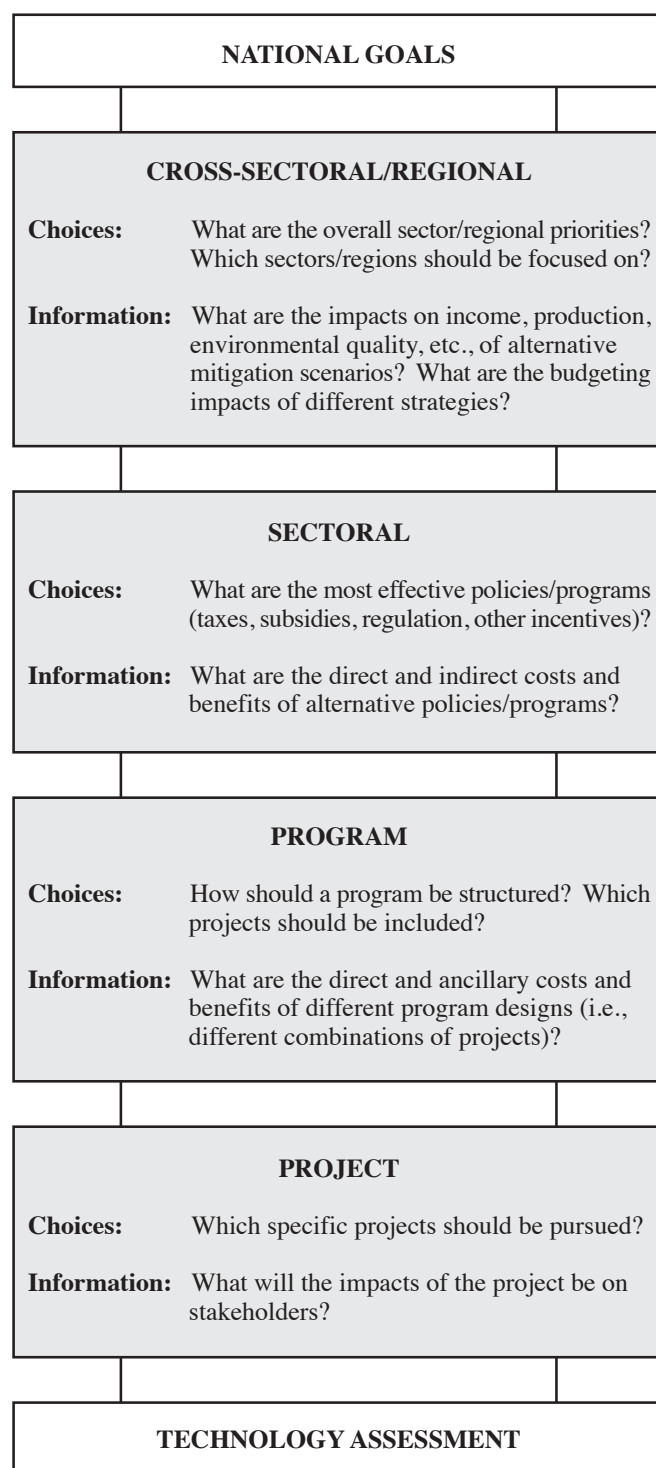


Figure 27-1: Levels of decisionmaking for assessing mitigation options.

(more specific discussion of the methods themselves is contained in Section 27.6):

- **Cross-sectoral level:** At the cross-sectoral level, alternative sectoral and cross-sectoral (e.g., recycling) mitigation options are compared to determine their impact on an economy and other national interests or goals. Typically this involves compiling information on sectoral activities that produce GHGs, such as energy production, or sequester those emissions, such as forestry activities. This information is integrated with national goals and priorities, and resources and responsibilities are allocated to produce a comprehensive, workable plan. The types of methods used to assess and compare options at this level include macroeconomic models, decision-analysis tools, costing methods, and forecasting tools.
- **Sectoral level:** The sectoral level involves analysis to compare the impacts of individual programs or large-scale projects within a specific sector principally for the purpose of prioritizing options and determining sectoral resource requirements. For example, the emission reduction potential and cost per ton of carbon dioxide (CO₂) reduced might be compared for options such as energy-efficiency standards, building codes, and rebates on high-efficiency appliances. As in the cross-sectoral level, costing and forecasting tools are important, although they focus on more detailed program and project information. In addition, integrated analytical tools are becoming available for certain sectors such as energy and forestry that can compare relatively disparate options on a more common basis.
- **Program level:** Program-level analysis compares the costs and impacts of individual projects or bundles of projects for the purpose of developing mitigation programs. A program might consist of a series of projects to introduce improved forestry-management practices into a region. As in cross-sectoral and sectoral analysis, project costing and forecasting tools are important. Technology costing and performance, market research, and monitoring and evaluation tools also are important.
- **Project level:** At the project level, the purpose of analysis is typically to identify and characterize specific project options in terms of their financial costs, technical performance, environmental characteristics, and so forth. Identifying options may involve literature reviews, case studies, and expert judgment. Characterizing options often relies extensively on engineering estimates, performance assessments, and project evaluations, for example.

27.4. Organizing a Mitigation Options Assessment

27.4.1. Organizational Steps

A systematic approach to organizing an assessment process can contribute significantly to the quality and effective communication

of results and effective implementation of recommended options. The approach can be developed by addressing four key questions:

- **How should assessment objectives be prioritized and who should be involved?** Mitigation options should be measured not only on the basis of their effectiveness in reducing GHGs but also on the basis of their contribution to other national objectives, such as sustainable development, rural development, or local environmental protection. Multiple stakeholders will be affected by these choices, so involving them in the process can be important.
- **What are the questions being answered by the analysis?** Effective decisionmaking requires the proper information; thus, mitigation analysis must focus on the proper questions. These questions will be defined broadly by national objectives but will vary depending on the decisionmaking level.
- **Which organizations will have institutional responsibility for the analysis?** Institutional capabilities are needed to gather data, select options to analyze, apply the necessary analytical methods, and communicate results. Key tasks involved in assigning the appropriate institutions to the assessment include identifying the available institutional resources, matching institutions to the research questions to be asked, coordinating among institutions, linking the analysis to the decisionmaking process, and designing feedback on the process to possible stakeholders.
- **Which organizations will have responsibility for implementing results?** Although the focus of this chapter is on methods for analysis of mitigation options, implementation issues cannot be completely separated in the discussion. Four factors to consider in the selection of options include the adequacy of implementation capabilities, institutional support for implementation, coordination of implementation, and evaluation and accountability.

27.4.2. Analytical Steps

Typically, a mitigation assessment process will follow a series of steps, each of which produces information for decisionmakers at different levels. The manner in which these steps are performed will reflect each country's resources, objectives, and decisionmaking process. Generally, these steps can be characterized as follows:

- **Baseline development:** Baselines, or "business-as-usual" scenarios, describe the growth in emissions expected as a result of economic growth, population growth, and other factors, assuming that no explicit mitigation policies are adopted.
- **Identification and characterization of alternative technologies and policies:** This may include ranking options with respect to costs, energy consumption, carbon sequestered, and ancillary impacts, among others.

- **Development of alternative scenarios:** Alternative scenarios include future projections of emissions [usually based on the global warming potential (GWP) of all GHGs] and costs, assuming that mitigation actions are taken.
- **Estimation of incremental costs and benefits of options:** Incremental costs and benefits are the difference between the baseline and alternative scenarios.
- **Assessment of the impacts of alternative GHG mitigation scenarios:** Impacts to consider could include macroeconomic, social, and environmental costs and benefits, and equity.
- **Sensitivity analysis:** The sensitivity of results to uncertainties in data or alternative assumptions is often assessed to ensure that the results are reliable and credible.

27.5. Key Methodological Issues

The choice and use of most analytical methods involve a number of methodological issues that decisionmakers and analysts should be aware of when considering a mitigation options assessment. Some of these issues are unique to certain methods, while others cut across many methods. This section outlines nine key methodological issues that span a number of methods:

- 1) **Top-down versus bottom-up analysis:** Significant controversy has existed between top-down and bottom-up approaches to estimating the costs of mitigation options. Each approach estimates mitigation costs differently, often with significantly different results. The top-down approach generally looks at macroeconomic impacts of alternative mitigation scenarios on income, consumption, or gross domestic product (GDP). A key assumption in the top-down approach is that economies are in equilibrium and that mitigating GHGs, therefore, generally entails some net cost to an economy. This assumption is often questioned by bottom-up analysts. Top-down models also have had problems accounting for different rates of technological change. The bottom-up approach looks at the microeconomic costs of and changes in demand due to individual mitigation options. It generally assumes that there are inefficiencies in the marketplace that allow for cost-effective mitigation options. Bottom-up models have had problems accounting for consumer behavior and administrative costs. In general, the top-down approach yields higher cost estimates for GHG mitigation than the bottom-up approach. Both approaches can serve important purposes, however, and improvements in both approaches are leading to more balanced results (Borero *et al.*, 1991; Krause *et al.*, 1993; UNEP, 1992). See IPCC Working Group III volume, Chapter 8, *Estimating Costs of Mitigating Greenhouse Gases*, Section 8.3.3., for a more thorough description of this issue.
- 2) **Matching method to objective:** Choosing the appropriate method for the analytical task depends on matching methods to objectives. For example, one objective for an expanding economy may be minimizing the impacts of GHG mitigation on the industrial sector. Sectoral impacts may be more appropriately measured using a macroeconomic analysis of options rather than an engineering cost approach. Alternatively, if an objective is to identify all technologies or policies that are cost-effective, a combination of engineering and cost-effectiveness methods may provide the best approach.
- 3) **Specifying the baseline and alternative scenarios:** Scenarios are used to portray future GHG emissions and economic activity without mitigation options in place (baseline or business-as-usual scenarios) or with policies in place (mitigation scenarios). Several issues in developing scenarios include the degree to which all sources and sinks are covered; the reasonableness of assumptions on economic growth, technology change, and market imperfections; the consistency of assumptions across analytical steps; and the capacity to incorporate feedbacks. Clearly defined scenarios are important for providing decisionmakers with useful guidance on the allocation of national resources. Scenarios also can play a significant role in the allocation of international funding for climate mitigation projects—for example, through the Global Environment Facility and through joint implementation projects.
- 4) **Accounting for uncertainty:** Most analyses are affected by uncertainty due to poor data quality, dynamic economies, economies with little historical market data, and so forth. Taking this uncertainty into account in estimating costs and impacts may be more practical than trying to achieve complete accuracy. This can be done by using “range” rather than “point” estimates, using expert judgment where good quantitative data are lacking, use of sensitivity analyses, and so on. Using these approaches will not eliminate uncertainty but will allow decisionmakers to attach greater confidence to those options and policies that yield favorable results (Stokey and Zeckhauser, 1978).
- 5) **Defining a common measure for comparing options:** A comprehensive and internally consistent assessment requires a common measure or “metric” for option comparison where different types of costs are involved or relevant impacts extend beyond the direct GHG reductions.
- 6) **Accounting for time in the analysis of costs and benefits:** The flows of costs and benefits from different mitigation options over time are often discounted to their present values so that they can be compared in consistent, present-value terms. The choice of discount rates has important implications but can be difficult to make in practice. Selection of a discount rate may depend on how displaced private uses are estimated, how imperfections in capital markets are

accounted for, and, perhaps most importantly, to what extent a country is willing to forgo current consumption and investment in favor of future environmental protection. Higher discount rates generally favor current consumption, while lower discount rates generally favor future environmental protection. Sensitivity analyses with different discount rates often are employed to estimate their different impacts (Stokey and Zeckhauser, 1978).

- 7) **Accounting for externalities and ancillary impacts:** Virtually every mitigation option will produce some positive or negative externality and/or ancillary impact. Whether quantifiable or not, these impacts represent real costs or benefits and should be factored into the assessment process.
- 8) **Data requirements:** A comprehensive mitigation assessment can require detailed information on literally hundreds of options. Few industrialized countries have access to all the data that would be required, but data availability is an even more serious constraint on developing countries. The cost of data collection is an important factor to weigh in developing a mitigation assessment.
- 9) **Understanding the limits of models:** Quantitative models, from simple spreadsheet costing models to sophisticated macroeconomic models, can be very useful for managing complex analytical tasks. However, the accuracy of the results from these models depends on the quality of data, the choice of assumptions, the appropriateness of the model to the analytical task, and so forth. All of these require good judgment and skill on the part of the analyst. The simple conclusion is that models are not a substitute for good analysis.

27.6. Analytical Methods

Table 27-1 illustrates the relationship between analytical methods and the different decisionmaking levels at which they are used. As shown, the same types of methods often are used at various decisionmaking levels (although the way methods are applied may be different at different levels). This section provides an overview of key analytical methods, including a brief description of the types of information the methods provide:

- **Macroeconomic analysis:** Macroeconomic analysis often is used to describe the current structure of an economy, to predict future economy-wide conditions and their impact on GHG emissions, and to analyze changes in these conditions that could arise from taking actions to mitigate GHG emissions (Borero *et al.*, 1991; Cline, 1992).
- **Decision analysis:** Decision-analysis methods provide a structure for integrating sectoral and cross-sectoral GHG mitigation objectives with other national priorities. Basic decision analysis involves identifying potential options, measuring the potential impacts of

those options (i.e., valuing the outcomes of various policy scenarios), and, based on this information, selecting the best options.

- **Costing analysis:** Mitigation costing methods estimate and compare costs and benefits of mitigation options to identify the set of actions that maximizes economic, social, and environmental benefits or minimizes the analogous costs of reducing GHGs. Four basic costing methods for ranking mitigation options are cost-benefit, cost-effectiveness, financial, and cost or supply curve analysis. More advanced methods include simulation and optimization models (Beaver and Huntington, 1991; Borero *et al.*, 1991; Cline, 1992; NAS, 1991; Stokey and Zeckhauser, 1978; UNEP, 1992, 1993). See the IPCC Working Group III volume for a detailed discussion of costing issues.
- **Forecasting:** The acceptability of a mitigation strategy, program, or project is determined by calculating the difference between “what would happen anyway” and “what would happen if mitigation measures were undertaken.” The definition and development of these scenarios play a significant role in mitigation assessment. Forecasting is used here as a general term applied to methods used in developing time-dependent scenarios, such as econometric, time-series analysis, and end-use forecasting models.
- **Integrated planning:** Integrated planning approaches provide a structure for complex regional or sectoral assessments of multiple mitigation options. These methods typically are process or decision analytic-based and

Table 27-1: Matching methods to decisionmaking levels.

Method/Level	Cross-Sectoral/ Regional	Sectoral Level	Program Level	Project Level
Macroeconomic	✗			
Decision Analysis	✗	✗	✗	✗
Forecasting	✗	✗	✗	
Costing Analysis	✗	✗	✗	✗
Integrated Planning		✗		
Market Research			✗	
Monitoring and Evaluation			✗	✗
Options Identification				✗
Options Characterization				✗

can be designed to produce both quantitative and qualitative results. A variety of quantitative methods can be used to support integrated planning. Integrated planning methods include integrated resource planning (IRP), used increasingly in the power sector; integrated transportation planning (ITP); and integrated forestry and agriculture planning (IIEC, 1994; Sathaye *et al.*, 1994). (For more information on integrated planning in forestry and agriculture, see Chapter 25.)

- **Market research:** Market research is an important analytical method in program design. Market research gathers information from prospective consumers of a particular product or service through focus groups, survey techniques, product testing, and so forth.
- **Monitoring and evaluation:** Mitigation programs and projects should be monitored and evaluated for their actual costs and impacts. The methods used often are the same used to assess a program or project in the first place, such as cost-effectiveness analysis and surveys. The key difference is the need to establish a monitoring and evaluation system during program or project design. This information can help determine whether initial objectives or targets are being achieved, how the program or project can be redesigned to improve results, and how future projects should be designed.
- **Options identification:** Many different mitigation options are available, as this report demonstrates. The analyst needs to identify those options that are most likely to suit the needs and conditions of his or her country. Typically, options are screened against a series of criteria such as technological maturity, commercial availability, and technical performance. Information on potentially suitable options can come from case studies, literature reviews, general opportunity studies, and the judgment of specialized experts.
- **Options characterization:** Once data have been obtained on specific mitigation options, a system is needed for characterizing options to ensure that the data obtained can provide usable information. A variety of methods are available to analysts, including cost curve analysis, estimates of tons of GHG avoided, and engineering assessments.

27.7. Conclusions

The information in this chapter and the accompanying technical documents provide a cross-section of the large body of knowledge and experience available to analyze mitigation options. The information demonstrates that:

- Analytical, technical, and institutional resources are available from many multilateral and bilateral organizations to assist developing countries and countries with economies in transition in assessing mitigation options and strategies. Other economic development assistance programs that support investment decisions in energy production and end-use efficiency, forestry management, transportation, and agriculture also may demonstrate ancillary GHG emission mitigation benefits.
- Mitigation analyses have been and are being applied in developed, developing, and transitional-economy countries. These experiences demonstrate that appropriate mitigation assessment methods can be applied to meet the individual needs and conditions of all countries.

As a result of the available information and the many international and national efforts to assess projects, programs, and national mitigation strategies—as described in more detail below—it is possible to conclude that:

- The availability of mitigation methods and assistance enables all countries to develop strategies and evaluate programs and projects that support national economic, social, and institutional development goals and can slow the rate of growth in GHG emissions. The process of conducting a mitigation options assessment presents challenges to all countries. Projects identified in assessments may be difficult to implement because of a variety of economic, social, and institutional barriers in all countries.
- Development and application of mitigation assessment methods in all sectors and at all levels is an ongoing effort that will result in further improvements in the tools and the capabilities of countries to assess mitigation options. The IPCC, in coordination with other multilateral institutions, could accelerate the dissemination of selected information on assessment methods through seminars, workshops, and educational materials.

Methods are available for assessing mitigation options: The total body of information and other resources available internationally on analytical methods is indeed extensive:

- The technical report accompanying this chapter identifies more than 40 often-used methods for analyzing mitigation options. Many more exist that can address specific issues or adapt to different levels of analytical capability. The technical report also provides countries with approaches for organizing a mitigation options assessment, from identifying national goals to estimating the costs of specific technology options. As with specific analytical methods, assessment processes can take many different forms, depending on the country's needs and conditions.

- From the accompanying appendices, countries also can obtain:
 - More detailed information on the actual application of many of the key methods, including information on appropriate uses for the different methods, potential pitfalls, and where to obtain further assistance
 - See how mitigation options analyses have been conducted in four case studies, ranging from actual experiences with mitigation costing techniques to the mitigation planning process of an individual developing country
 - Obtain step-by-step instructions in developing a mitigation plan using a well-defined set of analytical tools and planning approaches
 - Learn about the many mitigation assessment activities being conducted by other countries and international institutions.

Analytical and technical resources are available to support mitigation analysis. Experience demonstrates that methods are available and appropriate: The fact that mitigation analyses are being conducted in many types of countries and that resources are available to assist countries with their needs is demonstrated by the following:

- The United Nations Environment Programme (UNEP) and the United Nations Development Programme (UNDP) provide support to about twenty-nine developing countries to coordinate climate country studies that include mitigation options assessments. Additional countries are expected to be added. The assessments developed through these studies will provide models of different mitigation strategies, including least-cost mitigation strategies, that other countries will be able to follow.
- The UK, Germany, the Netherlands, and the United States together will have supported more than seventy-five climate country studies in developing countries and countries with economies in transition. (The total number of countries involved is somewhat fewer due to overlap.) Many of these studies are developing mitigation strategies as one component. It is also noteworthy that a number of the studies place significant emphasis on developing local institutional and analytical capabilities to assess and implement mitigation options.
- The pilot phase of the Global Environment Facility allocated about \$250 million for more than thirty global-warming mitigation projects. These funds were leveraged with additional World Bank and bilateral assistance funds. These projects will soon begin to yield a wealth of information and practical experience with different approaches to mitigating GHGs.

27.8. Obtaining a Copy of the Guidelines

Means to obtain the full guidelines appendix follow:

U.S. Environmental Protection Agency
Climate Policy and Programs Division
401 M Street, NW
Suite 2122
Washington, DC 20460
Attention: Michael Adler
202.260.9013 (voice) • 202.260.6405 (fax)
adler.michael@epamail.epa.gov (e-mail)

References

- Beaver**, R. and H. Huntington, 1991: A comparison of aggregate energy demand models being used for global warming policy analysis. Paper presented to the American Statistical Association, Energy Modeling Forum, Stanford University, Stanford, CA.
- Borero**, G., R. Clarke, and L.A. Winters, 1991: *The Macroeconomic Consequences of Controlling Greenhouse Gases: A Survey—Summary*. Department of Economy, University of Birmingham, Birmingham, UK.
- Cline**, W.R., 1992: *The Economics of Global Warming*. Institute for International Economics, Washington, DC.
- IIEC**, 1994: *A Methodology for Greenhouse Gas Mitigation in the Transport Sector*. IIEC, Washington, DC.
- Krause**, F., E. Haites, R. Howarth, J. Koomey, 1993: Cutting carbon emissions: burden or benefit? The economics of energy-tax and non-price policies. In: *Energy Policy in the Greenhouse*, vol. II, part 1. International Project for Sustainable Energy Paths, El Cerrito, CA.
- NAS**, 1991: *Policy Implications of Greenhouse Warming: Report of the Mitigation Panel*. Panel on Policy Implications of Greenhouse Gas Warming, National Academy Press, Washington, DC.
- Sathaye**, J., W. Makundi, and K. Andrasko, 1994: An approach to the evaluation of the costs and benefits of forestry mitigation options. *Biomass and Bioenergy*.
- Stokey**, E. and R. Zeckhauser, 1978: *A Primer for Policy Analysis*. W.W. Norton & Company, Inc., New York, NY.
- UNEP**, 1992: *UNEP Greenhouse Gas Abatement Costing Studies, Analysis of Abatement Costing Issues and Preparation of a Methodology to Undertake National Greenhouse Gas Abatement Costing Studies, Phase One Report*. UNEP Collaborating Centre on Energy and Environment, RISO National Laboratory, Denmark.
- UNEP**, 1993: *UNEP Greenhouse Gas Abatement Costing Studies, Analysis of Abatement Costing Issues and Preparation of a Methodology to Undertake National Greenhouse Gas Abatement Costing Studies, Phase Two Report*. UNEP Collaborating Centre on Energy and Environment, RISO National Laboratory, Denmark.